Universidad Popular del Cesar

Minería de datos y Patrones

Version 2024-I

Crossing Line Profiles

[Capítulo 2]

Dr. José Ramón Iglesias
DSP-ASIC BUILDER GROUP
Director Semillero TRIAC
Ingenieria Electronica
Universidad Popular del Cesar

X-ray testing: Castings

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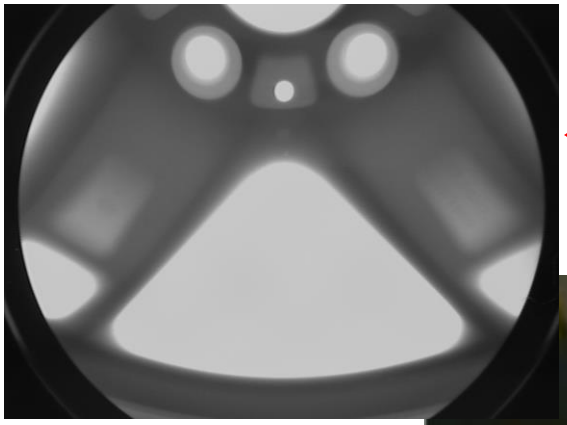
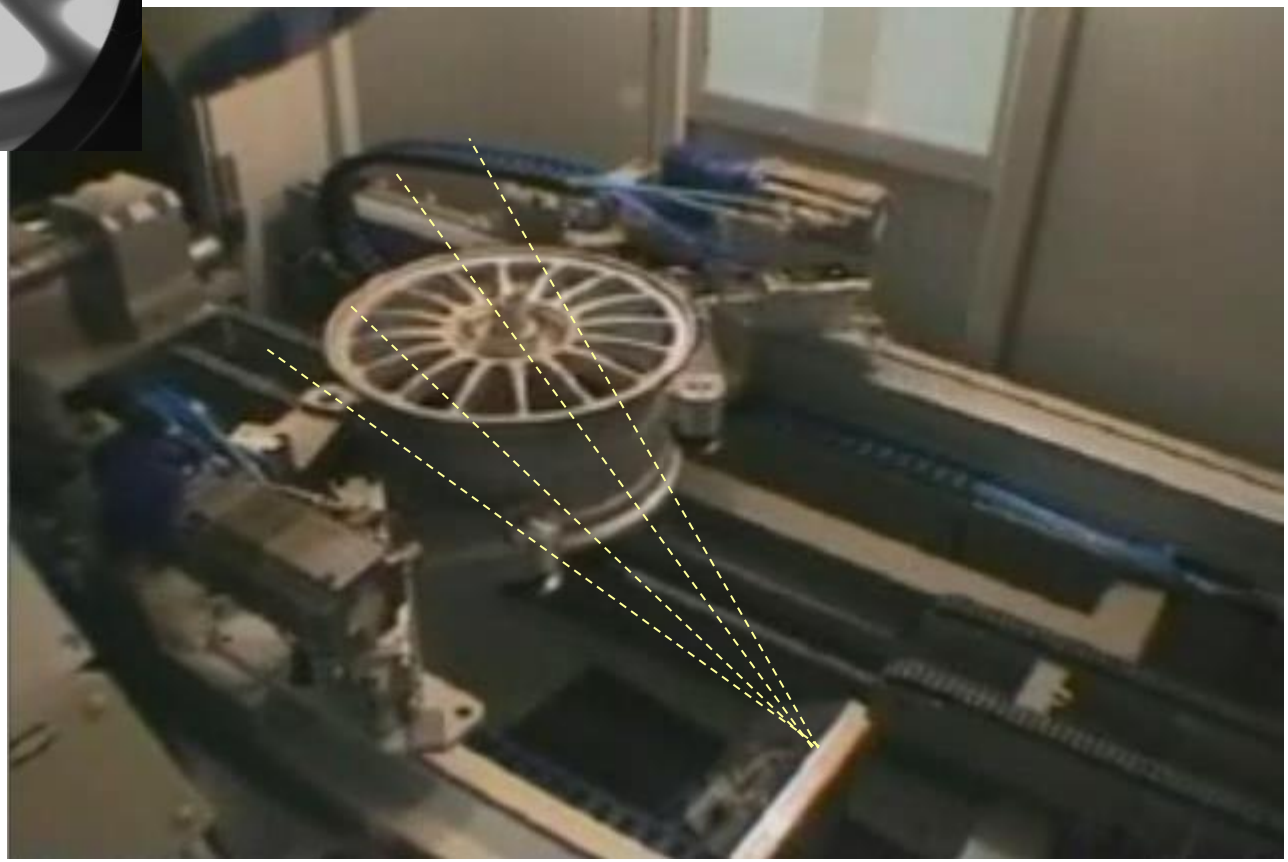
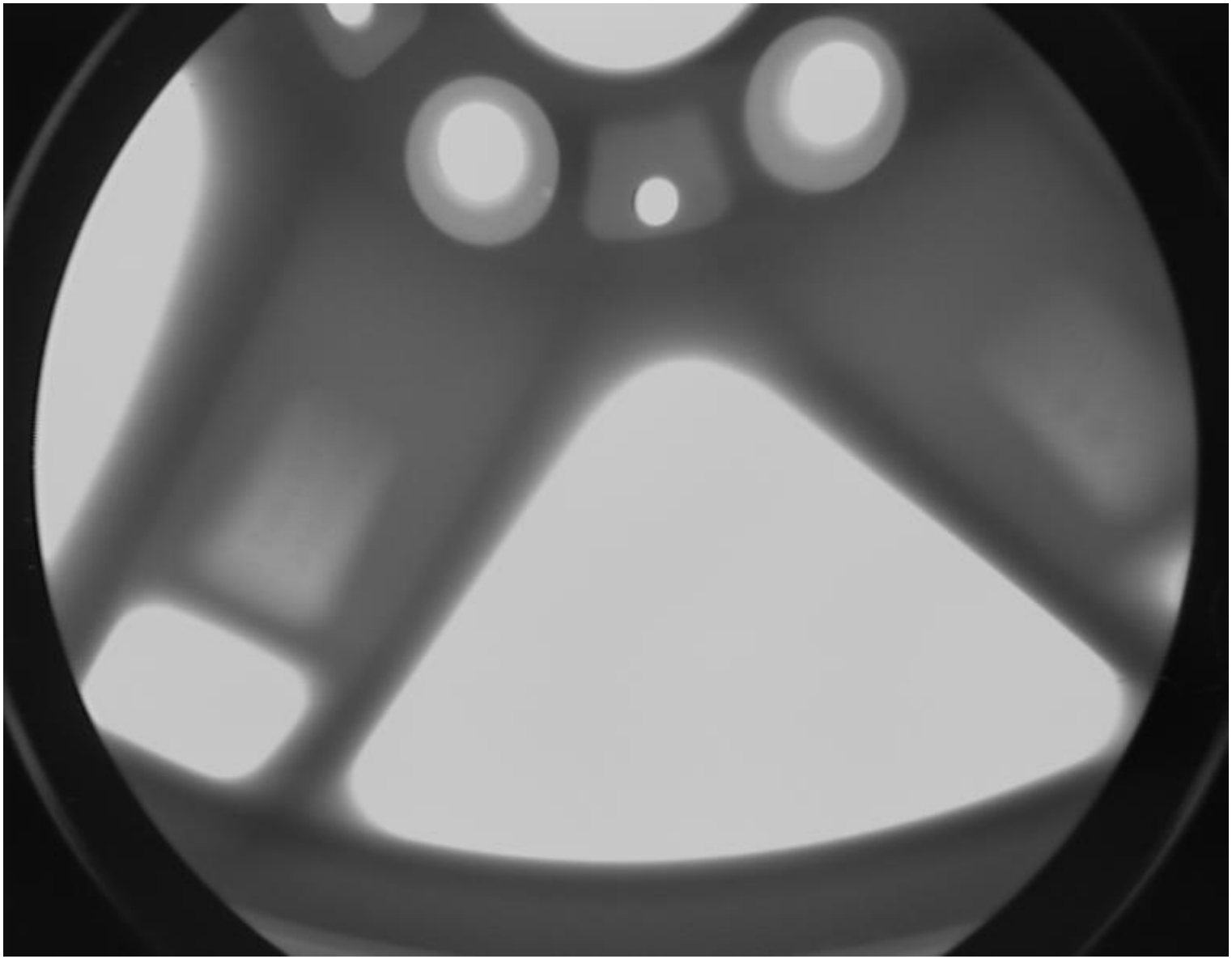
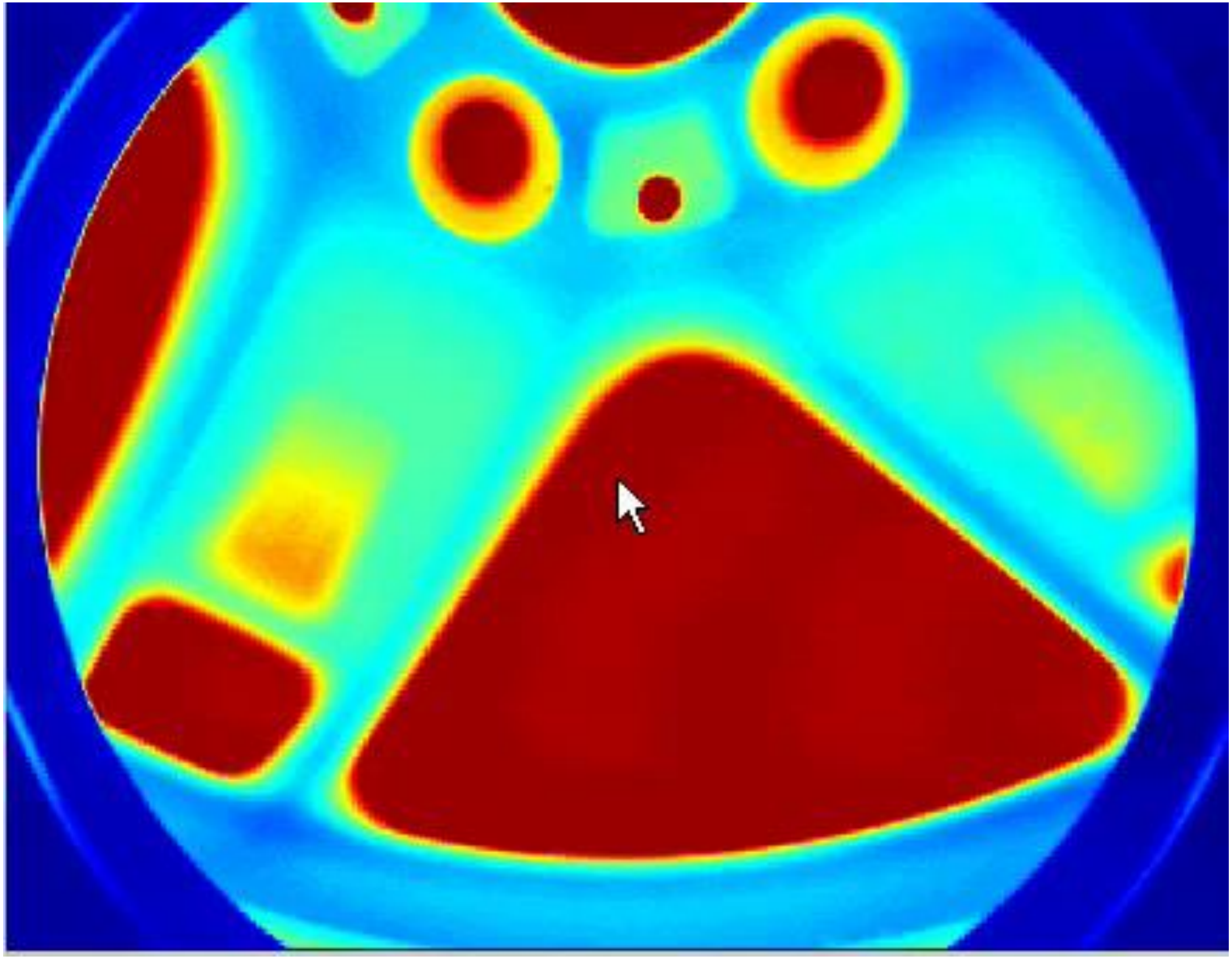




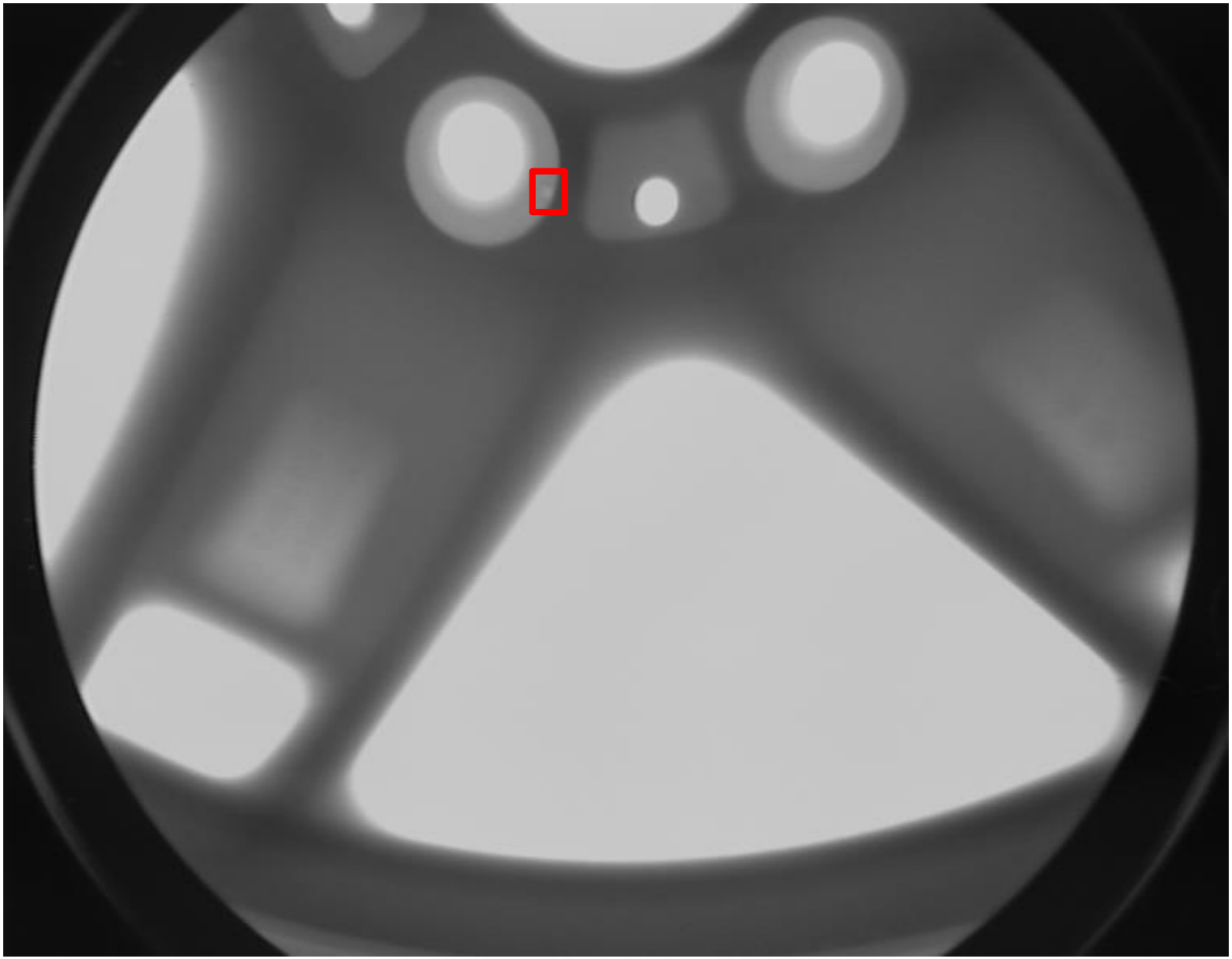
X-ray testing: Castings



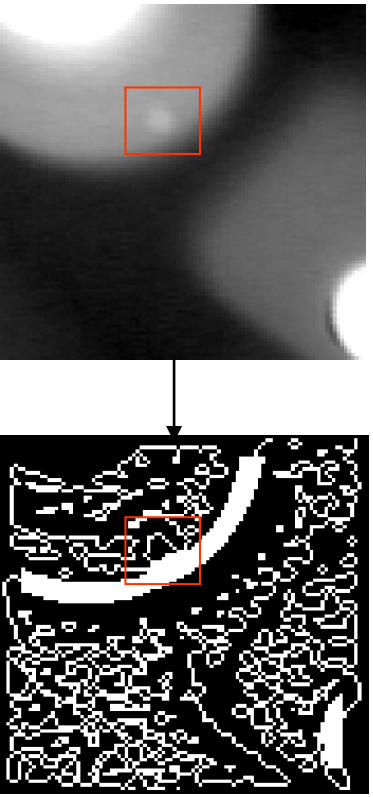
X-ray testing: Castings



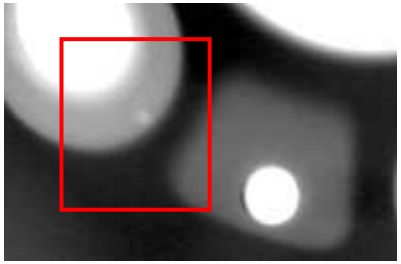
X-ray testing: Castings

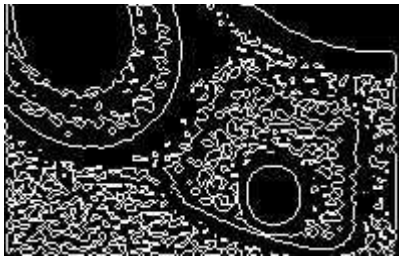


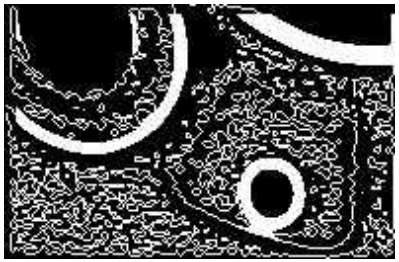
[Crossing line profiles]



[Segmentation of potential flaws]



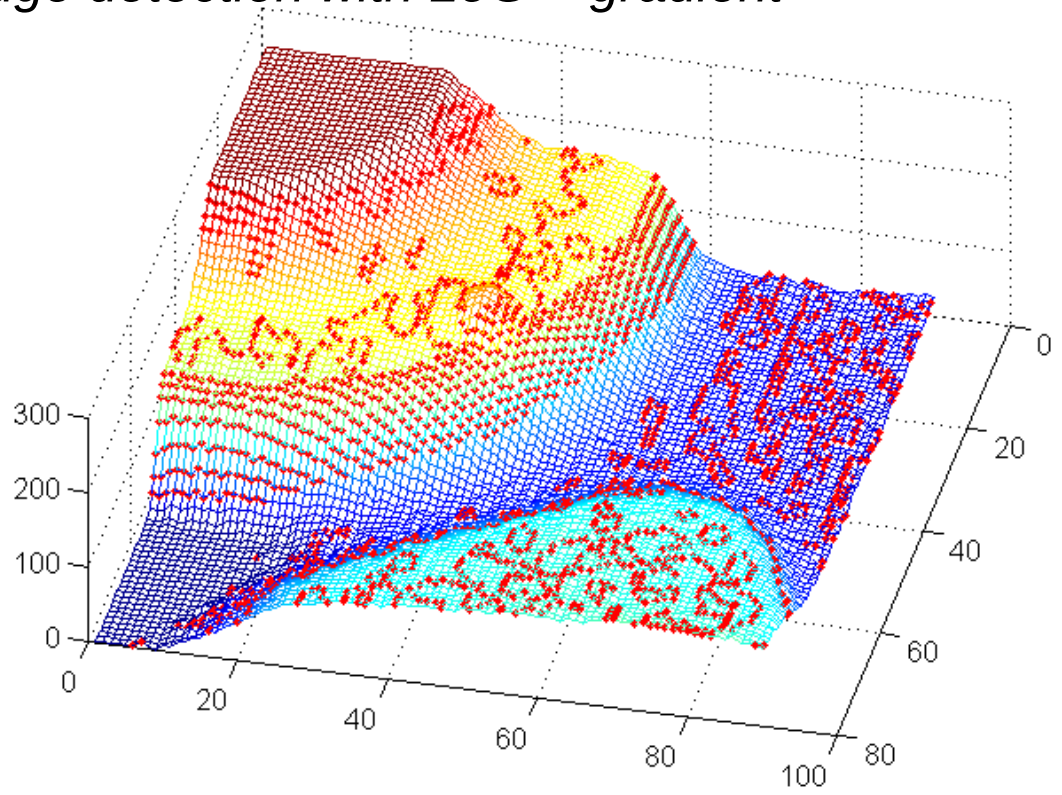




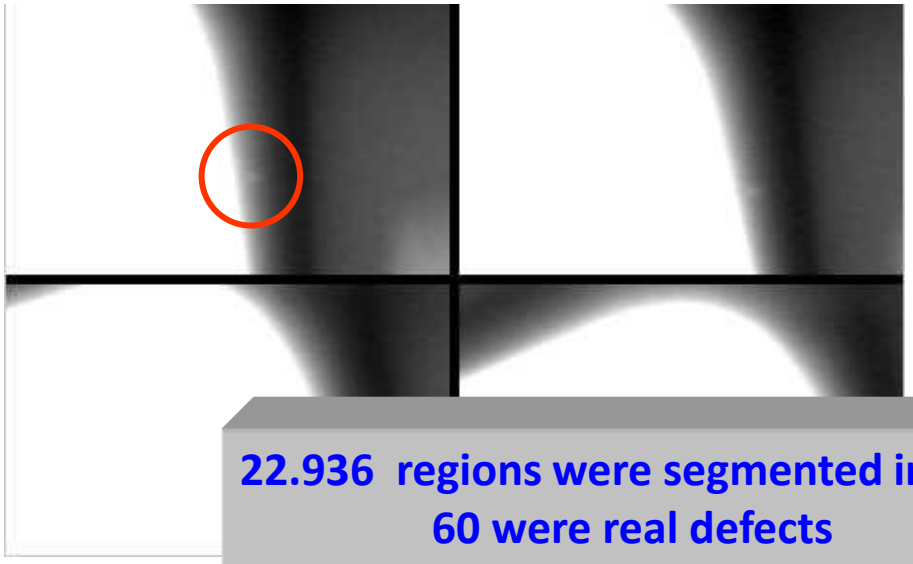
X-ray image in 3D

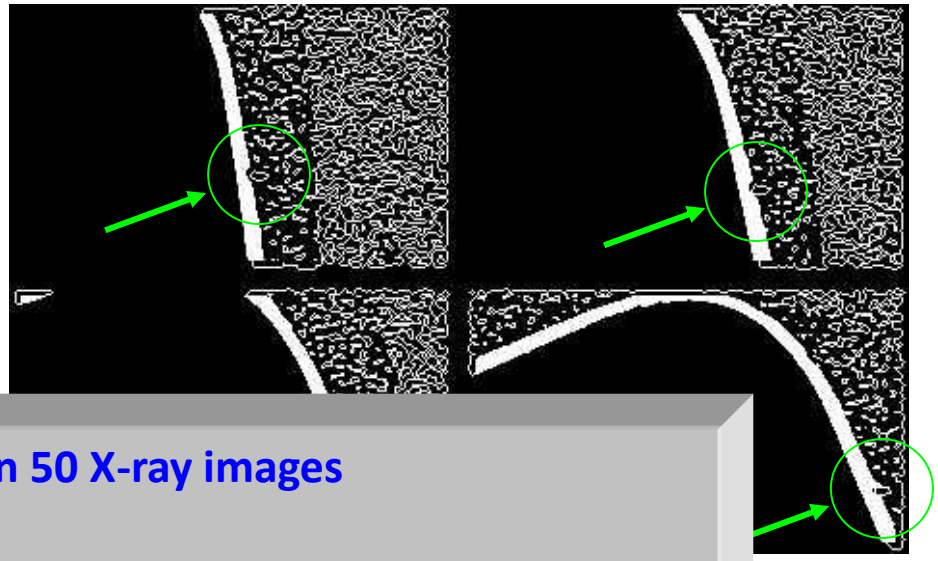
Edge detection with LoG

Edge detection with LoG + gradient



[Segmentation of potential flaws]



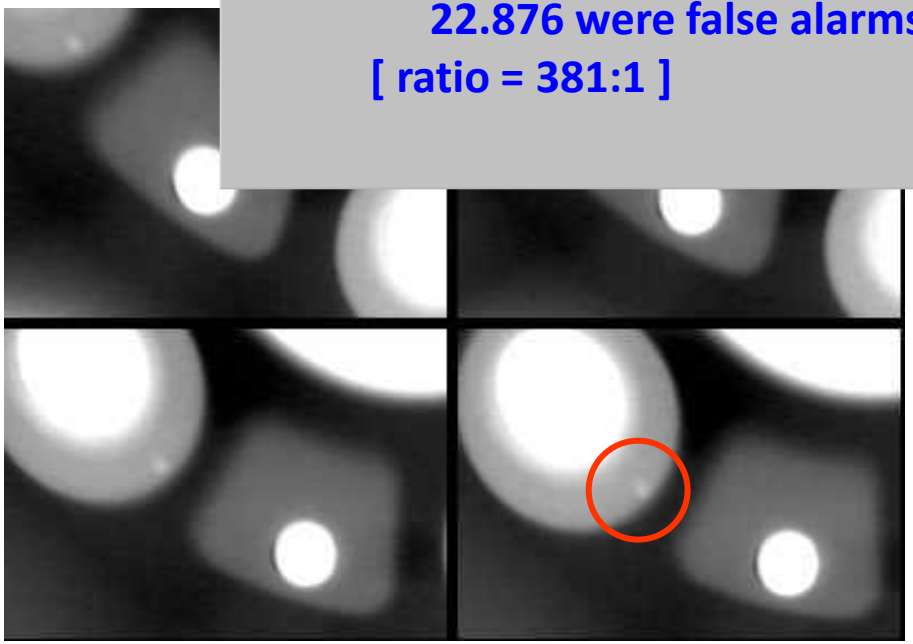


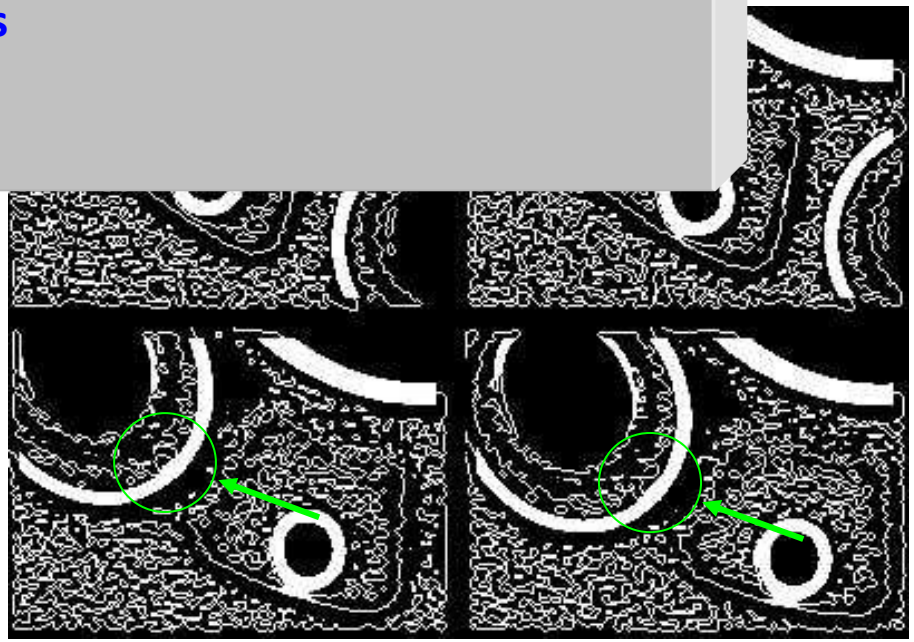
22.936 regions were segmented in 50 X-ray images

60 were real defects

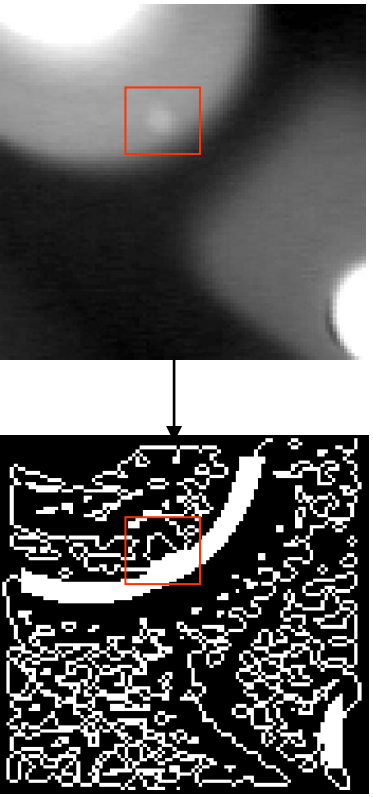
22.876 were false alarms

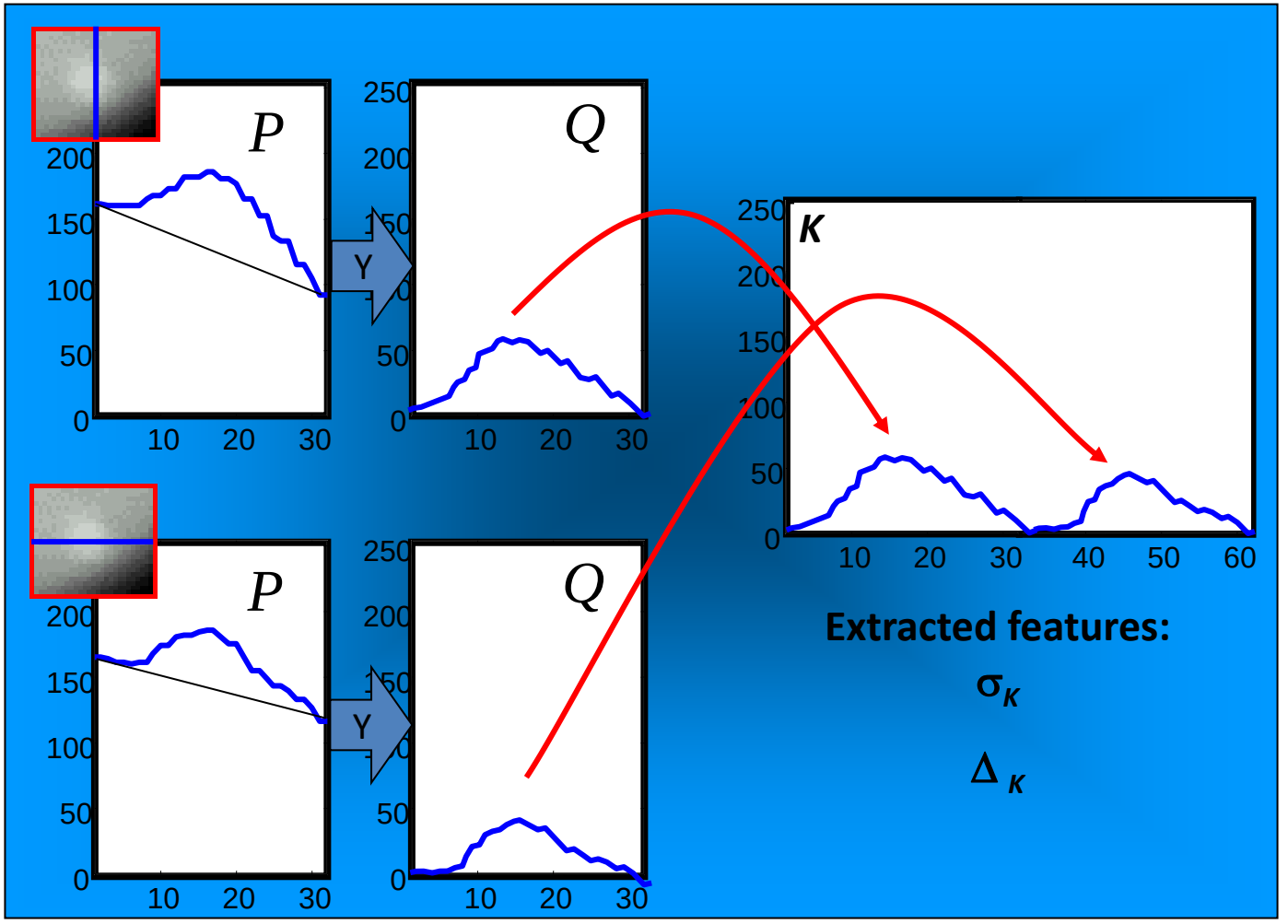
[ratio = 381:1]

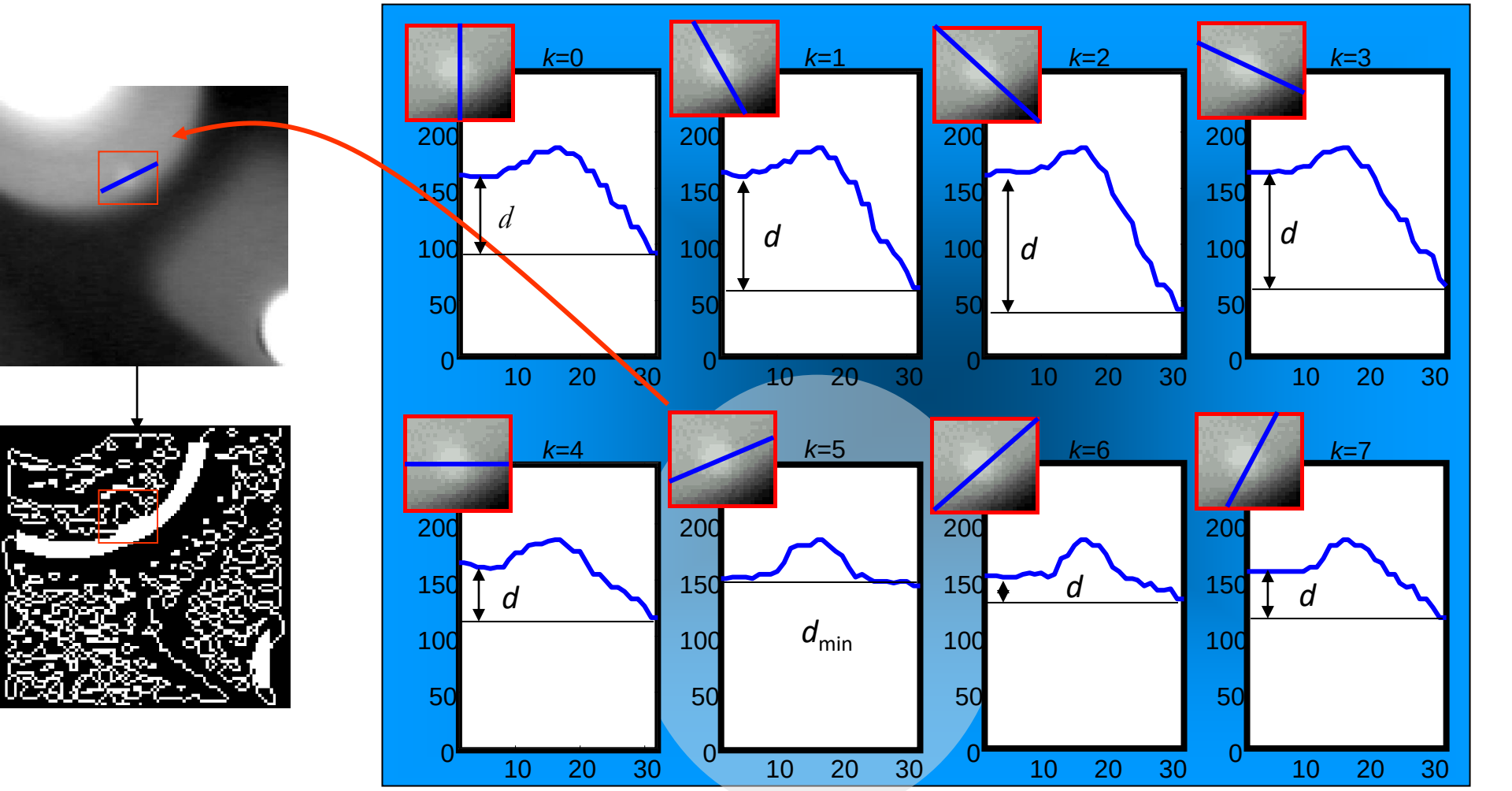




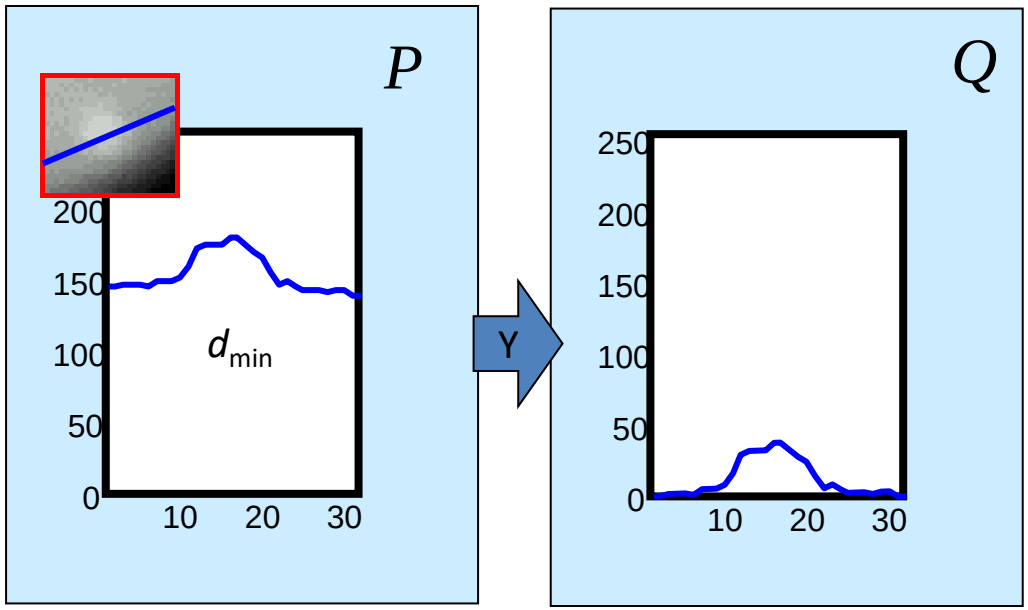
[Crossing line profiles]






k=0
k=1
k=2
k=3
k=4
k=5
k=6
k=7
d
d
d
d
d
d
d
d
d_min
200
150
100
50
0
10
20
30

Selected Crossing Line Profile



Extracted features:

$\overline{Q}$

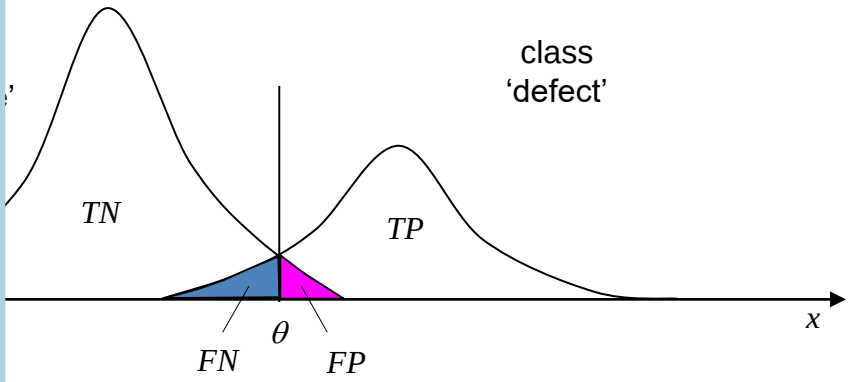
σ_Q

Δ_Q

F = DFT(Q)

Ideal:

FN = 0
FP = 0
Sn = 100%
1-Sp = 0%
Az = 1

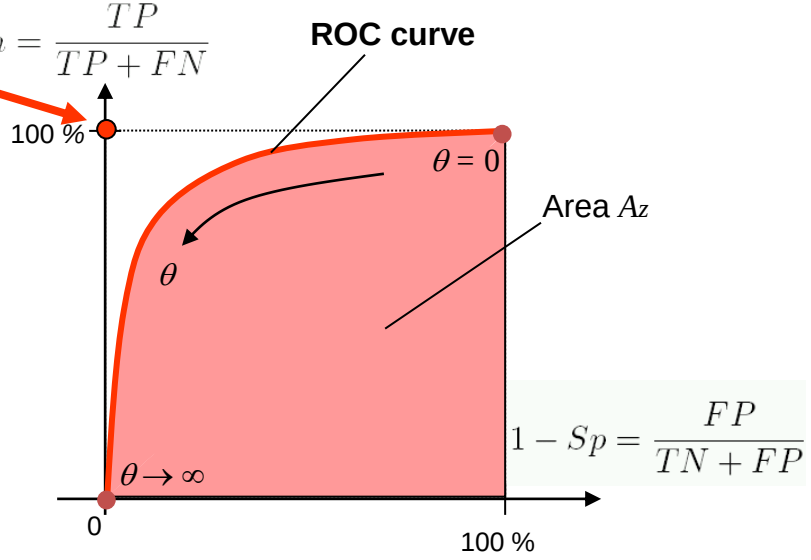


Confusion matrix

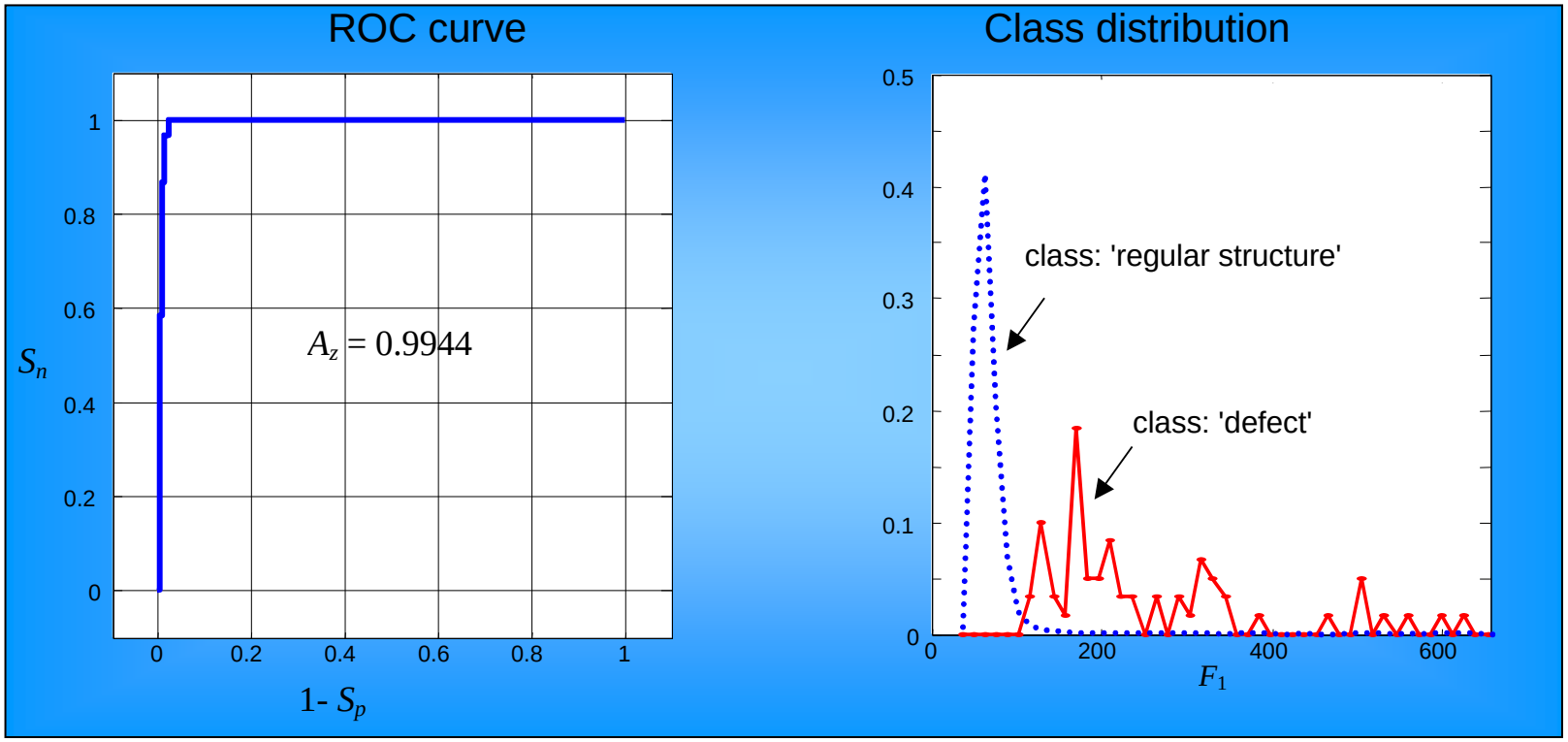
the region is ↓ \ the region is classified as→	'regular structure'	'defect'
Regular structure	*TN*	*FP*
defect	*FN*	*TP*

(b)

$$Sn = \frac{TP}{TP + FN}$$



(c)



ROC and class distribution for CLP feature for F_1

[4. Performance analysis]

Ranking	Feature	A_z
1	F_1	0.9944
2	σ_Q	0.9927
3	Δ_O	0.9901
4	σ_K	0.9897
5	Δ_K	0.9891
6	$\bar{Q}$	0.9856
7	$f_8(5)$	0.9725
8	$f_{13}(2)$	0.9711

Top six are based on CLP

[4. Performance analysis]

at S_n = 95%

CLP

Ranking	Feature	A_z	FP/image	
1	F_1	0.9944	6.4	proposed
2	σ_Q	0.9927	8.7	
3	Δ_O	0.9901	10.8	
4	σ_K	0.9897	12.5	early work
5	Δ_K	0.9891	16.5	
6	$\bar{Q}$	0.9856	19.4	
7	$f_8(5)$	0.9725	34.6	texture features
8	$f_{13}(2)$	0.9711	44.1	

Threshold classifier